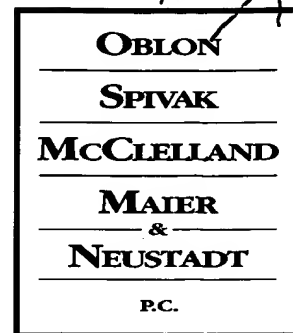




Docket No.: 213480USO

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313



ATTORNEYS AT LAW

RE: Application Serial No.: 09/942,626

Applicants: Sei TSUNODA, et al.

Filing Date: August 31, 2001

For: LOW DIELECTRIC CONSTANT MATERIAL  
HAVING THERMAL RESISTANCE, INSULATION  
FILM BETWEEN SEMICONDUCTOR LAYERS  
USING THE SAME, AND SEMICONDUCTOR  
DEVICE

Group Art Unit: 1751

Examiner: HAMLIN, D.G.

SIR:

Attached hereto for filing are the following papers:

**Appeal Brief**

Our credit card payment form in the amount of \$500.00 is attached covering any required fees. In the event any variance exists between the amount enclosed and the Patent Office charges for filing the above-noted documents, including any fees required under 37 C.F.R. 1.136 for any necessary Extension of Time to make the filing of the attached documents timely, please charge or credit the difference to our Deposit Account No. 15-0030. Further, if these papers are not considered timely filed, then a petition is hereby made under 37 C.F.R. 1.136 for the necessary extension of time. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.

Norman F. Oblon

Harris A. Pitlick

Registration No. 38,779

Customer Number

**22850**

(703) 413-3000 (phone)

(703) 413-2220 (fax)



DOCKET NO: 213480US0

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :  
SEI TSUNODA, ET AL. : EXAMINER: HAMLIN, D. G.  
SERIAL NO: 09/942,626 :  
FILED: AUGUST 31, 2001 : GROUP ART UNIT: 1751  
FOR: LOW DIELECTRIC CONSTANT :  
MATERIAL HAVING THERMAL  
RESISTANCE, INSULATION FILM  
BETWEEN SEMICONDUCTOR LAYERS  
USING THE SAME, AND  
SEMICONDUCTOR DEVICE

APPEAL BRIEF

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

This is an appeal of the Final Rejection dated November 19, 2004 of Claims 1 and 3-9. A Notice of Appeal, along with a petition for a two-month extension of time, was timely filed on April 19, 2005.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Mitsubishi Denki Kabushiki Kaisha having an address 2-3, Marunouchi 2-chome, Chiyoda-ku, Tokyo 100-8310, Japan.

06/16/2005 SZEWDIE1 00000017 09942626

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## II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and the assignee are aware of no appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

## III. STATUS OF THE CLAIMS

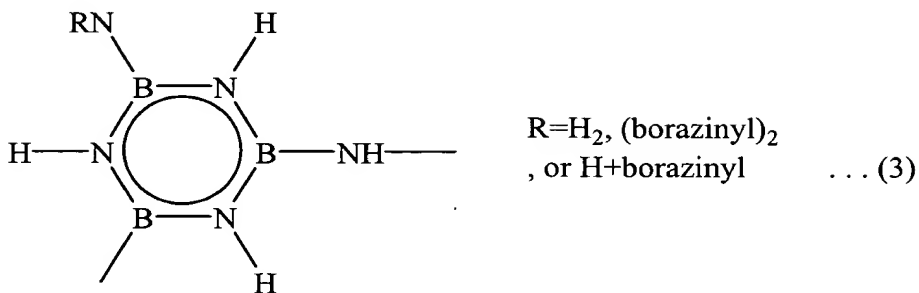
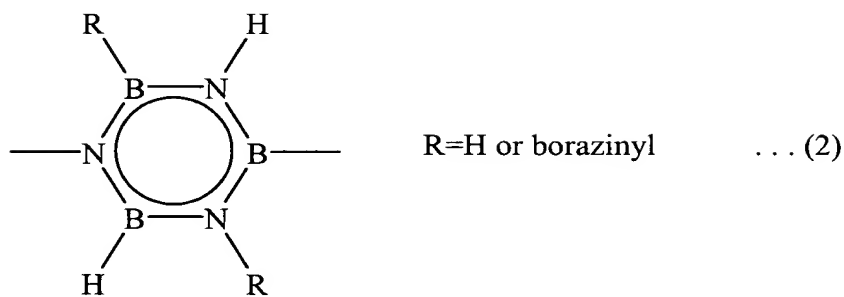
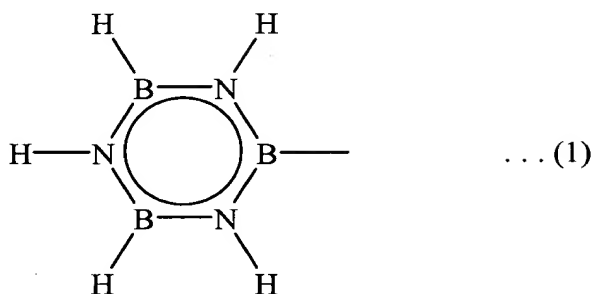
Claims 1 and 3-9, all the claims in the application, stand rejected and are herein appealed.

## IV. STATUS OF THE AMENDMENT

An Amendment under 37 CFR 1.116 was timely filed on February 7, 2005, which canceled Claim 10 as the only amendment. In an Advisory Action entered May 19, 2005, the Examiner made no acknowledgement of entry or non-entry of the amendment, but responded to Applicants' arguments made therein. Since the amendment only cancels a claim, it is assumed that it has been entered.

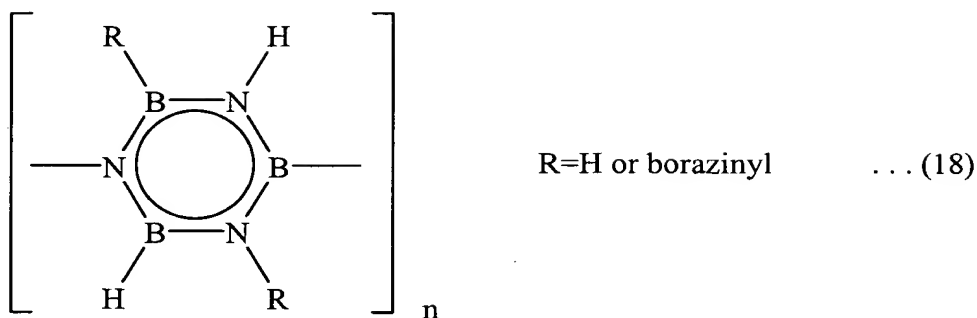
## V. SUMMARY OF THE CLAIMED SUBJECT MATTER

As recited in independent Claim 1, the invention is an insulation film for use between semiconductor layers, comprising borazine moieties shown by the following formula (1), (2), or (3) as part of an inorganic or organic material molecule, wherein said film has a dielectric constant of at most 2.4 and a thermal resistance of at least 450°C.



See the specification at page 3, line 7 through page 4, line 12, combined with the paragraph bridging pages 15 and 16.

As recited in independent Claim 6, the invention is also a film comprising a material having the following formula (18):



wherein n is an integer, and having a gold electrode deposited thereon, wherein said material may be partially crosslinked.

See the specification at Example 1.

As recited in independent Claim 7, the invention is also a film comprising poly(aminoboraziny) having a gold electrode deposited thereon, wherein the poly(aminoboraziny) is partially crosslinked.

See the specification at Example 2.

As recited in independent Claim 8, the invention is also a film comprising poly(B-vinylborazine), and having a gold electrode deposited thereon, wherein the poly(B-vinylborazine) is partially crosslinked.

See the specification at Example 3.

As recited in independent Claim 9, the invention is also a film comprising a poly(styrene-co-B-vinylborazine), and having a gold electrode deposited thereon, wherein the poly(styrene-co-B-vinylborazine) is partially crosslinked.

See the specification at Example 4.

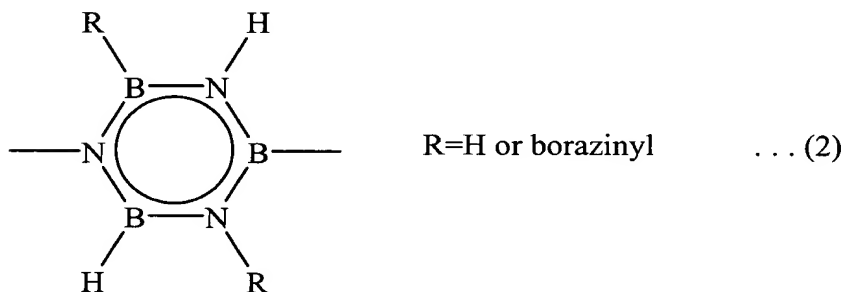
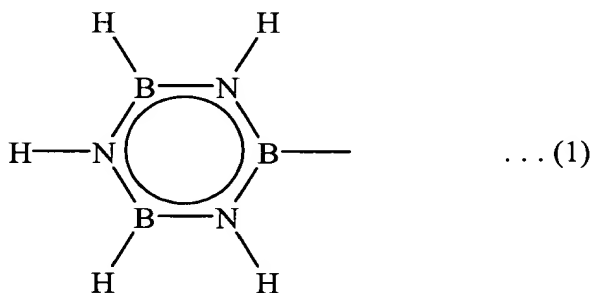
## VI. GROUNDS OF REJECTION

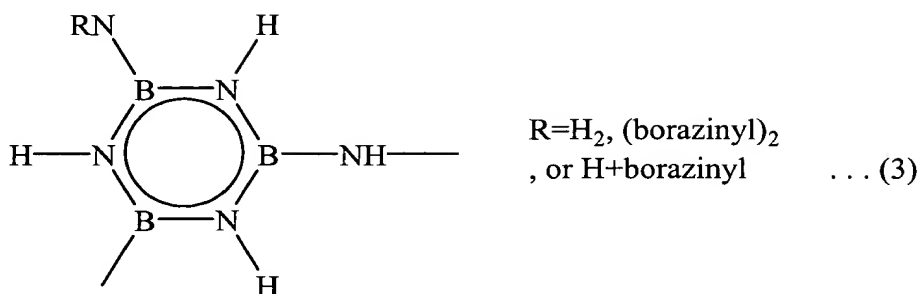
Claims 1 and 3-9 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Paine et al, "Recent Developments in Borazine-Based Polymers," *Am. Chem Soc.* (1994), Chapter 27, pages 358-74 (Paine et al).

## VII. ARGUMENT

Claims 1 and 3-9 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Paine et al. That rejection is untenable and should not be sustained.

The present invention is based on Applicants' discovery that inorganic or organic compounds having a particular borazine skeletal moiety therein can result in materials having a relatively low dielectric constant and relatively high thermal resistance. The moieties may have one of the following formulae (1), (2), or (3):





As recited in present Claim 1, the claimed invention is an insulation film between semiconductor layers comprising the above-discussed material. As described in the specification at page 16, lines 7-10, since electronic signal retardation becomes small by applying the insulation film to a semiconductor device such as a IC substrate or electric appliances, high speed of the device can be achieved.

Paine et al discloses various borazine-based polymers, methods of making them, and some uses thereof. Indeed, Paine et al is described in the specification herein at page 11, lines 14-21 as a source for a method of making materials of the present invention. However, Paine et al neither discloses nor suggests the use of their polymers *per se* in film form, let alone as an insulation film between semiconductor layers in a semiconductor device, let alone as an insulation film between semiconductor layers in a semiconductor device wherein the film has a dielectric constant of at most 2.4 and a thermal resistance of at least 450°C. Rather, Paine et al discloses their borazine-based polymers as chemical precursors of boron nitride, as well as a “reagent for the formation of new composite metal-nitride/metal-boride materials that have improved properties over the individual pure phase metal boride or nitride” (page 364, first and second paragraphs). While the Examiner relies on the disclosure of processing polymer solutions to form, *inter alia*, coatings, xerogels, and aerogels (page 367, first full paragraph), the Examiner has ignored the description therein that all of these

forms “are converted to BN [boron nitride] in these forms.” In the present invention, on the other hand, the film is of a material containing a borazine moiety, not boron nitride *per se*.

Claim 3

Claim 3 is separately patentable, because Paine et al neither discloses nor suggests a semiconductor device, let alone one comprising an insulation film, let alone the insulation film of Claim 1, between semiconductor layers.

Claim 4

Claim 4 is separately patentable, because Paine et al neither discloses nor suggests an insulation film, let alone the insulation film of Claim 1, wherein the molecule contains at least one moiety selected from the following formulae (11) – (17).

Claim 5

Claim 5 is separately patentable, because Paine et al neither discloses nor suggests an insulation film, let alone the insulation film of Claim 1, wherein the inorganic material is selected from the group consisting of silicates, silazanes, silsequioxanes, siloxanes, and silanes, and the organic material is selected from the group consisting of poly(aryl ether), parylene, polyphenylene, polyphenylenevinylene, and polybenzocyclobutene.

Claim 6

Claim 6 is separately patentable, because Paine et al neither discloses nor suggests a film comprising a material having the formula (18), and having a gold electrode deposited thereon, wherein the material may be partially crosslinked. Particularly, Paine et al discloses no such film, or a gold electrode deposited thereon.



Claim 7

Claim 7 is separately patentable, because Paine et al neither discloses nor suggests a film comprising poly(aminoborazinyl) having a gold electrode deposited thereon, wherein the poly(aminoborazinyl) is partially crosslinked. Particularly, Paine et al discloses no such film, or a gold electrode deposited thereon.

Claim 8

Claim 8 is separately patentable, because Paine et al neither discloses nor suggests a film comprising poly(B-vinylborazine), and having a gold electrode deposited thereon, wherein the poly(B-vinylborazine) is partially crosslinked. Particularly, Paine et al discloses no such film, or a gold electrode deposited thereon.

Claim 9

Claim 9 is separately patentable, because Paine et al neither discloses nor suggests a film comprising a poly(styrene-co-B-vinylborazine), and having a gold electrode deposited thereon, wherein the poly(styrene-co-B-vinylborazine) is partially crosslinked. Particularly, Paine et al discloses no such film, or a gold electrode deposited thereon.

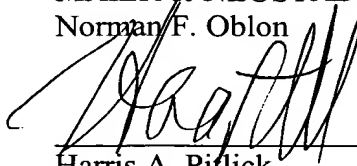
For all the above reasons, it is respectfully requested that the rejection over Paine et al be REVERSED.

VIII. CONCLUSION

For the above reasons, it is respectfully requested that all the rejections still pending in the Final Office Action be REVERSED.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.  
Norman F. Oblon



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Harris A. Pitlick  
Registration No. 38,779

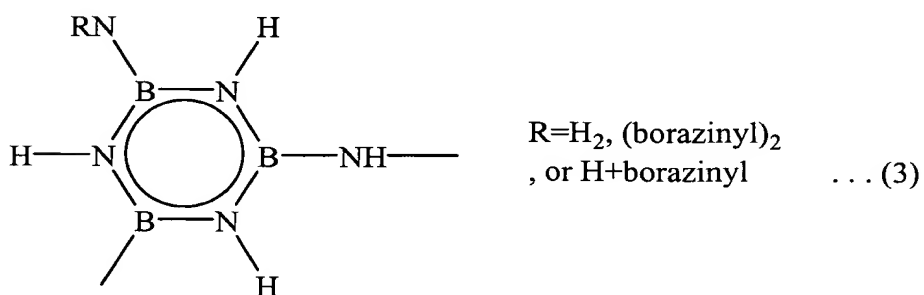
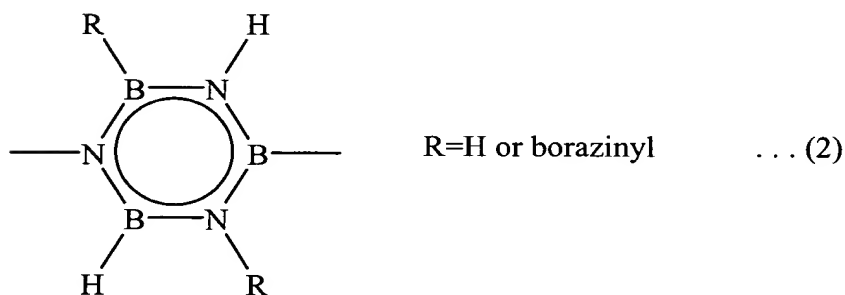
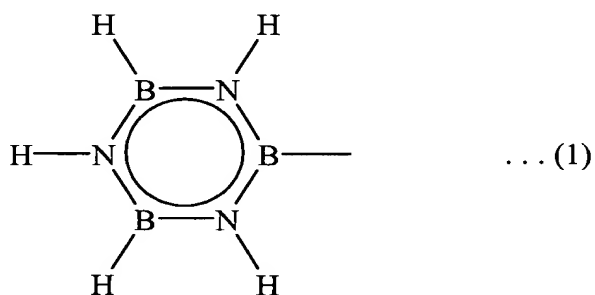
Customer Number  
**22850**

Tel: (703) 413-3000  
Fax: (703) 413 -2220  
(OSMMN 08/03)  
NFO/HAP/cja



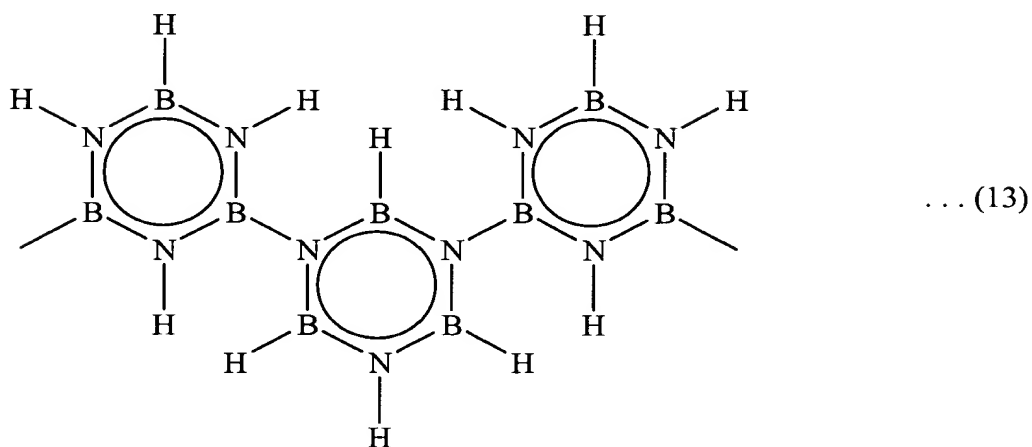
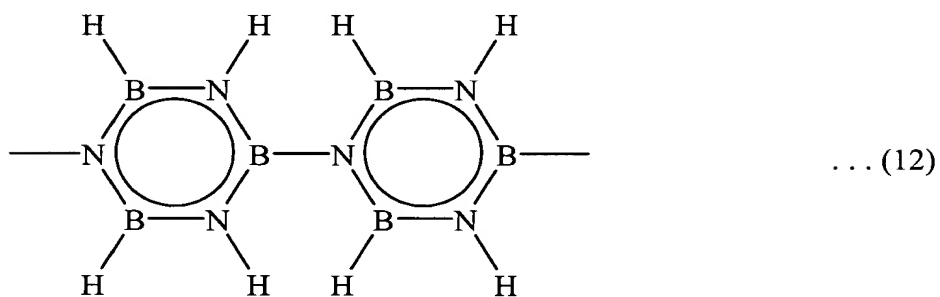
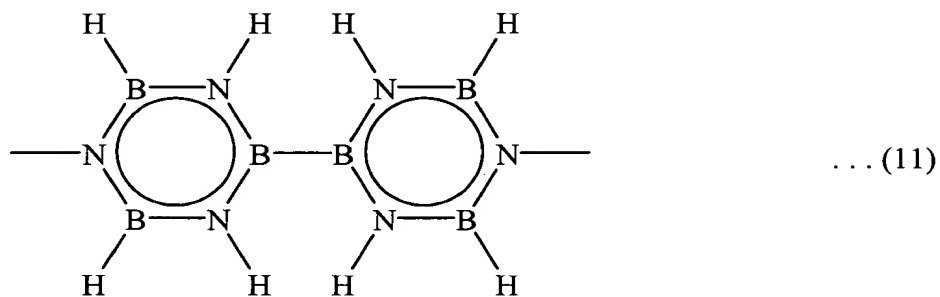
## CLAIMS APPENDIX

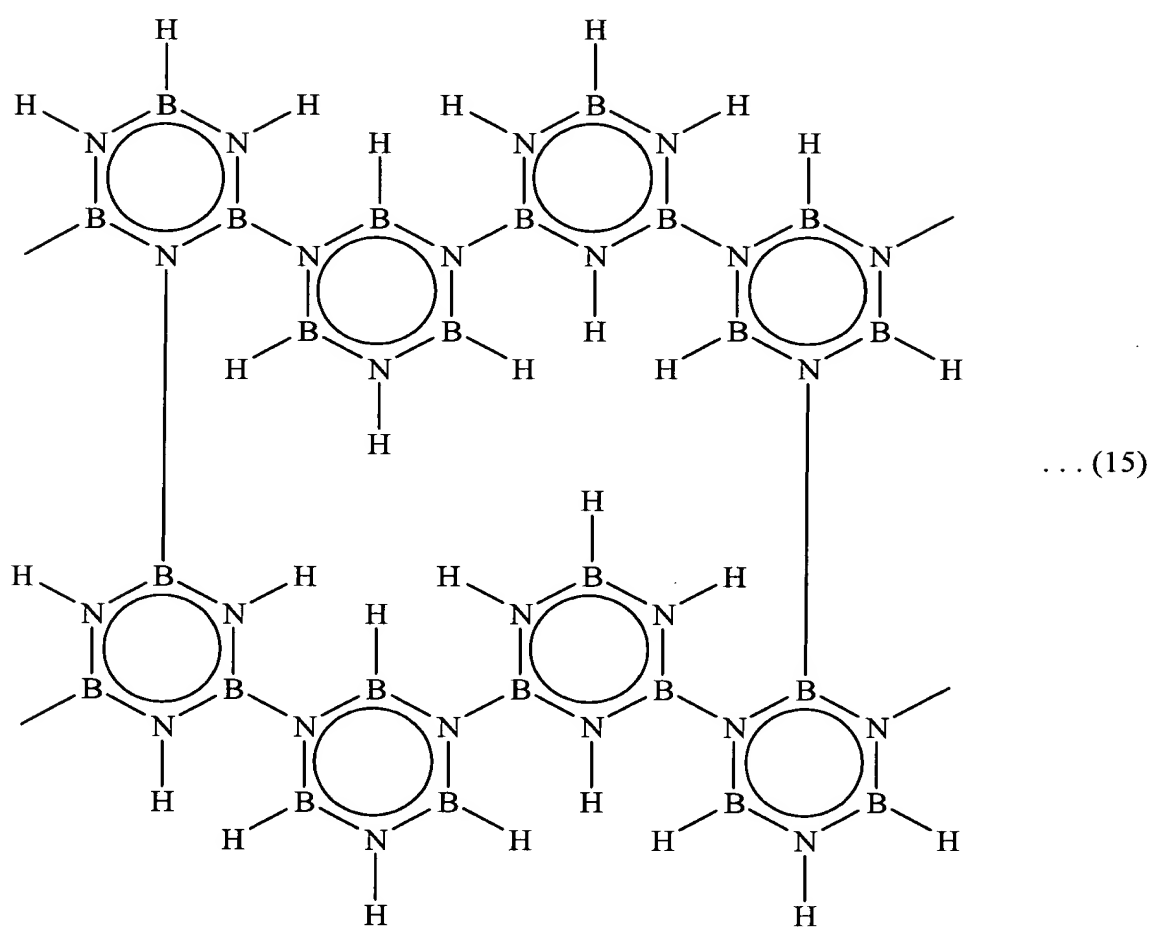
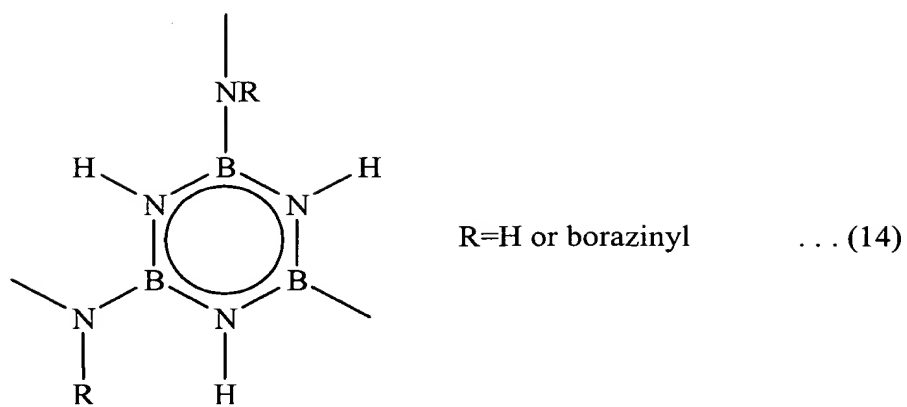
Claim 1: An insulation film for use between semiconductor layers, comprising borazine moieties shown by the following formula (1), (2), or (3) as part of an inorganic or organic material molecule, wherein said film has a dielectric constant of at most 2.4 and a thermal resistance of at least 450°C.

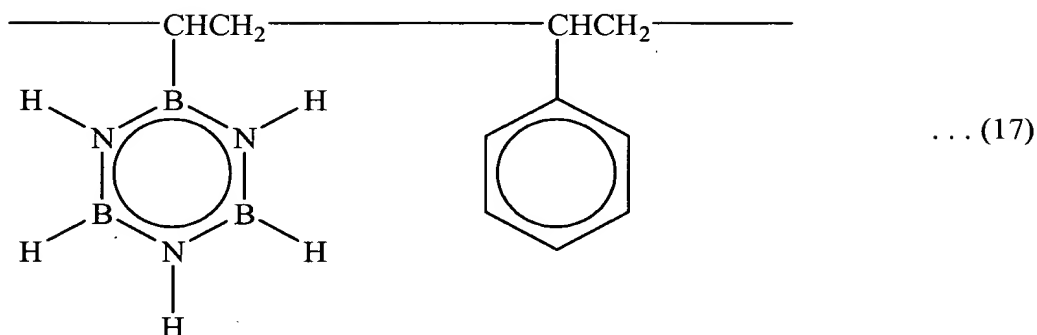
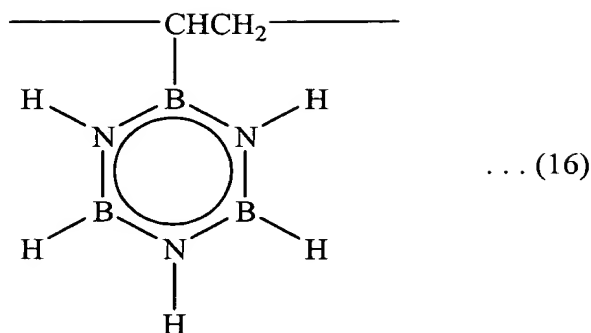


Claim 3: A semiconductor device, comprising the insulation film of Claim 1, between semiconductor layers.

Claim 4: The insulation film of Claim 1, wherein said molecule contains at least one moiety selected from the following formulae (11) – (17):

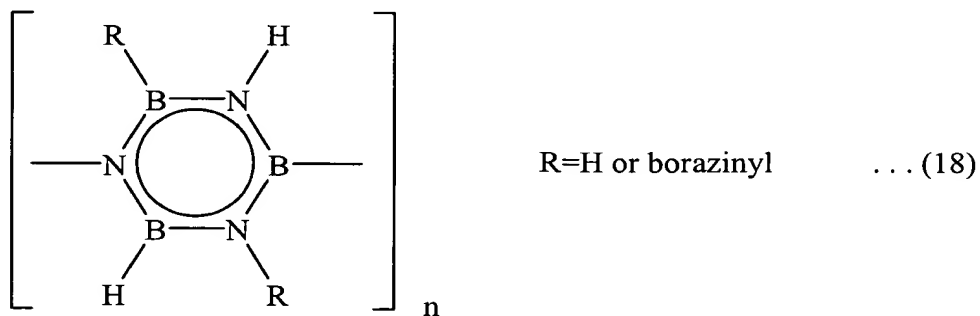






Claim 5: The insulation film material of Claim 1, wherein the inorganic material is selected from the group consisting of silicates, silazanes, silsequioxanes, siloxanes, and silanes, and the organic material is selected from the group consisting of poly(aryl ether), parylene, polyphenylene, polyphenylenevinylene, and polybenzocyclobutene.

Claim 6: A film comprising a material having the following formula (18):



wherein  $n$  is an integer, and having a gold electrode deposited thereon, wherein said material may be partially crosslinked.

Claim 7: A film comprising poly(aminoborazinyl) having a gold electrode deposited thereon, wherein the poly(aminoborazinyl) is partially crosslinked.

Claim 8: A film comprising poly(B-vinylborazine), and having a gold electrode deposited thereon, wherein the poly(B-vinylborazine) is partially crosslinked.

Claim 9: A film comprising a poly(styrene-co-B-vinylborazine), and having a gold electrode deposited thereon, wherein the poly(styrene-co-B-vinylborazine) is partially crosslinked.

## EVIDENCE APPENDIX

None.



RELATED PROCEEDINGS APPENDIX

None.